CLAIMS

1. (currently amended) A method, comprising:

receiving one or more demands for service in a mesh network comprising a plurality of nodes interconnected by a plurality of links;

specifying a threshold corresponding to a number of failure-related cross-connections; and

mapping each of the one or more demands onto a primary path and a restoration path in the network to generate a path plan for the one or more demands in the network, wherein:

reduction of a portion of restoration time associated with failure-related cross-connections in the network is taken into account during the mapping; and

the mapping generates the path plan based on the specified threshold such that, for all nodes in the mesh network, the number of failure-related cross-connections at each node is less than the specified threshold.

2. (canceled)

3. (currently amended) The ~~invention~~ method of claim 1, wherein the mapping results in a maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum.

4. (currently amended) The ~~invention~~ method of claim 3, wherein a graph-theoretic condition is used to derive the theoretical minimum.

5. (currently amended) The ~~invention~~ method of claim 4, wherein the theoretical minimum is defined by $\max_{n \in N} \{\lceil \delta_n / d_n \rceil\}$ where n, a node in the network, is an element of N, the set of all nodes in the network, δ_n is the number of unit demands terminated on node n, and d_n is the number of edges incident on node n.

6. (currently amended) The ~~invention~~ method of claim 1, wherein the mapping sequentially evaluates each possible path plan for each of the one or more demands and selects the path plan having a smallest maximum number of failure-related cross-connections.

7. (currently amended) The ~~invention~~ method of claim 1, wherein the mapping comprises:

selecting two node-disjoint paths for each demand, wherein leveling of link loads is taken into account during the selecting; and

for each demand, identifying one of the two node-disjoint paths as the primary path and the other as the restoration path, wherein a maximum number of failure-related cross-connections at all nodes in the network is taken into account during the identifying.

8. (currently amended) The ~~invention~~ method of claim 7, wherein:

selecting the two node-disjoint paths for each demand minimizes maximum link bandwidth in the network; and

identifying the primary and restoration paths for each demand results in the maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum.

9. (currently amended) The ~~invention~~ method of claim 8, wherein a tent pole condition is used to derive the theoretical minimum.

10. (currently amended) The ~~invention~~ method of claim 7, wherein the selecting of the two node-disjoint paths for each demand and the identifying, for each demand, of the one of the two node-disjoint paths as the primary path and the other as the restoration path are implemented using mixed-integer programming ~~is used in each of the selecting and the identifying~~.

11. (currently amended) The ~~invention~~ method of claim 7, wherein the selecting of the two node-disjoint paths for each demand and the identifying, for each demand, of the one of the two node-disjoint paths as the primary path and the other as the restoration path are implemented using genetic programming ~~is used in each of the selecting and the identifying~~.

12. (currently amended) The ~~invention~~ method of claim 7, wherein the selecting of the two node-disjoint paths for each demand and the identifying, for each demand, of the one of the two node-disjoint paths as the primary path and the other as the restoration path are implemented using a commercial solver ~~is used in each of the selecting and the identifying~~.

13. (currently amended) The ~~invention~~ method of claim 1, wherein the mapping involves demand bundling, wherein demands having a common source node and a common destination node are grouped and routed along a single pair of disjoint primary and restoration paths and at least a portion of connection signaling for the group is carried out jointly.

14. (currently amended) The ~~invention~~ method of claim 1, wherein the mapping involves traffic aggregation, wherein multiple low-rate channels in the network are consolidated into a high-rate channel and rerouting of the high-rate channel requires fewer cross-connections than rerouting of the multiple low-rate channels.

15. (currently amended) A network manager for a mesh network comprising a plurality of nodes interconnected by a plurality of links, the network manager ~~adapted to~~ comprising:

means for receiving ~~receive~~ one or more demands for service in the network;

means for specifying a threshold corresponding to a number of failure-related cross-connections; and

means for mapping each of the one or more demands onto a primary path and a restoration path in the network to generate a path plan for the one or more demands in the network, wherein:

reduction of a portion of restoration time associated with failure-related cross-connections in the network is taken into account during the mapping; and

the means for mapping generates the path plan based on the specified threshold such that, for all nodes in the mesh network, the number of failure-related cross-connections at each node is less than the specified threshold.

16. (canceled)

17. (currently amended) The ~~invention~~ network manager of claim 15, wherein the path plan results in a maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum.

18. (currently amended) The ~~invention~~ network manager of claim 17, wherein a graph-theoretic condition is used to derive the theoretical minimum.

19. (currently amended) The ~~invention~~ network manager of claim 18, wherein the theoretical minimum is defined by: $\max_{n \in N} \left\{ \left\lceil \delta_n / d_n \right\rceil \right\}$ where n, a node in the network, is an element of N, the set of all nodes in the network, δ_n is the number of unit demands terminated on node n, and d_n is the number of edges incident on node n.

20. (currently amended) The ~~invention~~ network manager of claim 15, wherein the network manager comprises means for sequentially ~~evaluates~~ evaluating each possible path plan for each of the one or more demands and ~~selects~~ means for selecting the path plan having a smallest maximum number of failure-related cross-connections.

21. (currently amended) The ~~invention~~ network manager of claim 15, wherein the network manager ~~is adapted to~~ comprises:

means for performing selection of two node-disjoint paths for each demand, wherein leveling of link loads is taken into account during the selection; and

means for identifying, for each demand, one of the two node-disjoint paths as the primary path and the other as the restoration path, wherein a maximum number of failure-related cross-connections at all nodes in the network is taken into account during the identifying.

22. (currently amended) The ~~invention~~ network manager of claim 21, wherein:

the means for performing the selection of the two node-disjoint paths for each demand minimizes maximum link bandwidth in the network; and

the means for identifying the primary and restoration paths for each demand results in the maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum.

23. (currently amended) The ~~invention~~ network manager of claim 22, wherein a ~~graph-theoretical result~~ tent pole condition is used to derive the theoretical minimum.

24. (currently amended) The ~~invention~~ network manager of claim [[22]] 21, wherein the means for performing the selection and the means for identifying the primary and restoration paths are implemented using mixed-integer programming ~~is used in each of the selection and the identifying~~.

25. (currently amended) The ~~invention~~ network manager of claim [[22]] 21, wherein the means for performing the selection and the means for identifying the primary and restoration paths are implemented using genetic programming ~~is used in each of the selection and the identifying~~.

26. (currently amended) The ~~invention~~ network manager of claim [[22]] 21, wherein the means for performing the selection and the means for identifying the primary and restoration paths are implemented using a commercial solver ~~is used in each of the selection and the identifying~~.

27. (currently amended) The ~~invention~~ network manager of claim 15, wherein the network manager ~~is adapted to~~ comprises means for considering demand bundling in the generation of the path plan, wherein demands having a common source node and a common destination node are grouped and routed along a single pair of disjoint primary and restoration paths and at least a portion of connection signaling for the group is carried out jointly.

28. (currently amended) The ~~invention~~ network manager of claim 15, wherein the network manager ~~is adapted to~~ comprises means for considering traffic aggregation in the generation of the path plan, wherein multiple low-rate channels in the network are consolidated into a high-rate channel and rerouting of the high-rate channel requires fewer cross-connections that rerouting of the multiple low-rate channels.

29. (new) A method, comprising:

receiving one or more demands for service in a mesh network comprising a plurality of nodes interconnected by a plurality of links; and

mapping each of the one or more demands onto a primary path and a restoration path in the network to generate a path plan for the one or more demands in the network, wherein:

reduction of a portion of restoration time associated with failure-related cross-connections in the network is taken into account during the mapping;

the mapping results in a maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum;

a graph-theoretic condition is used to derive the theoretical minimum; and

the theoretical minimum is defined by $\max_{n \in N} \{ \lceil \delta_n / d_n \rceil \}$ where *n*, a node in the network, is an element of *N*, the set of all nodes in the network, δ_n is the number of unit demands terminated on node *n*, and d_n is the number of edges incident on node *n*.

30. (new) A network manager for a mesh network comprising a plurality of nodes interconnected by a plurality of links, the network manager comprising:

means for receiving one or more demands for service in the network; and

means for mapping each of the one or more demands onto a primary path and a restoration path in the network to generate a path plan for the one or more demands in the network, wherein:

reduction of a portion of restoration time associated with failure-related cross-connections in the network is taken into account during the mapping;

the path plan results in a maximum number of failure-related cross-connections at all nodes in the network being within a specified tolerance of a theoretical minimum;

a graph-theoretic condition is used to derive the theoretical minimum; and

the theoretical minimum is defined by: $\max_{n \in N} \left\{ \left\lceil \delta_n / d_n \right\rceil \right\}$ where n, a node in the network, is an element of N, the set of all nodes in the network, δ_n is the number of unit demands terminated on node n, and d_n is the number of edges incident on node n.